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TEXAS — GEOLOGICAL & AGRICULTURAL SURVEY — FIRST REPORT OF PROGRESS — 1893





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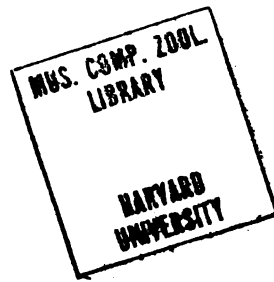
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FIRST REPORT OF PROGRESS

OF THE

Geological and Agricultural Survey

OF TEXAS.

BY B. F. SHUMARD, STATE GEOLOGIST.

PRINTED BY ORDER OF THE EIGHTH LEGISLATURE.

AUSTIN:

PRINTED BY JOHN MARSHALL & CO., STATE PRINTERS.
1859.

Hon. M. D. K. Taylor,

Speaker of the House of Representatives :

The committee on State Affairs, to which was referred the Governor's Message, transmitting to the Senate and House of Representatives, the Report of the State Geologist, have had the same under consideration, and instruct me to report the following resolution and recommend its passage.

F. F. FOSCUE.

One of the committee.

Resolved, That twelve hundred copies of the Report of the State Geologist, together with the accompanying documents, be *printed*, one thousand copies for the use of the House, and two hundred for the use of the State department. Adopted.

RESOLUTION OF THE SENATE.

Resolved, That 500 copies of the Report of the State Geologist, now in the hands of the Committee on Printing in the House of Representatives, be ordered to be printed for the use of the Senate. Adopted.

EXECUTIVE OFFICE, }
AUSTIN, Dec. 3rd, 1859. }

*Gentlemen of the Senate and
House of Representatives :*

I enclose herewith, a letter of the State Geologist, communicating his report, in conformity with the act under which he received his appointment.

H. R. RUNNELS.

GEOLOGICAL OFFICE, }
AUSTIN, Dec. 1, 1859. }

To his Excellency, H. R. Runnels,

Governor of the State of Texas :

Sir : I have the honor to submit herewith, a Report showing the progress of the Geological and Agricultural Survey of the State from its commencement to the present time. It will be seen that I have not attempted to furnish a detailed account of our operations, but merely a general statement of the work done, together with some of the leading results. The time intervening between the organization of the corps and the meeting of the Legislature, was too short to permit us to accomplish any great amount of field work, and prepare besides, a full report accompanied with the necessary maps, diagrams and sections. It was therefore deemed advisable to devote as much time as possible, to investigations in the field. As there have been two and sometimes three parties, constantly at work in different parts of the State, a very large district of country has been examined.

Our field operations were brought to a close about the 1st of November, and since then, the several members of the corps have been actively engaged in the Geological Rooms and Laboratory. Much time is required to unpack, label, examine and classify the large amount of material that has already accumulated, and it is proposed to devote the winter months to this work, and in ma-

king analyses of soils, subsoils, rocks, ores, coals and mineral waters.

It gives me pleasure to mention that the Survey has thus far been eminently successful, and our detailed report will show that Texas possesses not only unbounded agricultural resources, but vast mineral wealth.

With much respect,

I am, sir, your ob't sv't,

B. F. SHUMARD.

REPORT OF PROGRESS.

On the 25th of August, 1858, I had the honor of receiving from His Excellency, Governor Runnels, a notice of my appointment to conduct the Geological and Agricultural Survey of Texas, authorized by an act of the Legislature, passed February 10th, 1858.

By this act it is made the duty of the State Geologist to make as speedily as possible, "a thorough and complete Geological Survey of the State, so as to determine accurately the quality and characteristics of the soil and its adaption to agricultural purposes—the species of produce to which the soil in different sections is adapted—its mineral resources, their location and the best means for their development its water powers, their location and capacities and generally everything relating to the Geological and Agricultural character of the State."

On receipt of the above notice, and under directions from the Governor, I proceeded immediately to make the necessary arrangements for commencing the field work of the Survey as early as practicable.

As the interests of the Survey demanded that the instruments employed in the work, should be of the best construction, I visited Philadelphia and New York early in September, and gave my personal attention to the selection of them, and also made arrangements for the purchase of such chemicals, as would be needed in the Laboratory.

Returning to St. Louis, two weeks were employed in packing my collection of geological and mineralogical specimens and library for shipment to Texas, and immediately thereafter, I started for Austin, where I arrived on the 30th of October.

On the 21st December, Geo. G. Shumard, M. D., who had already spent several years in investigating the geology of Texas and New Mexico, while acting in the capacity of Geologist to the U. S. Governments, Expeditions of Capt's. Marcy and Pope, was

appointed Assistant Geologist, and on the 18th of January, 1859, Prof. W. P. Riddell A. M., M. D. of the Texas Military Institute was appointed Chemist and Assistant Geologist.

As no provision was made for a draughtsman in the act authorizing the Survey, and as maps of the districts to be explored were immediately needed, it was deemed necessary to employ such a person, allowing him a reasonable compensation for his services. Accordingly, with the approval of His Excellency, the Governor, Mr. A. Roessler, was employed for this duty.

As the subject of Climatology, in its connection with agriculture, is of great importance, we have made partial arrangements to establish a regular system of meteorological observations throughout the State, on the plan adopted by the Smithsonian Institution at Washington. For this purpose complete sets of instruments of excellent construction have been placed in the hands of competent observers, from whose labors we may anticipate interesting results. Prof. C. G. Forshey so well known for his scientific attainments, who has already devoted much attention to the Climatology of Texas, has obligingly consented to take charge of one set of instruments at Rutersville, and Swante Palm Esq., of Austin, a skillful and accurate observer, of another. A third set has been until recently in charge of the Geological party in the northern part of the State.

Everything being in readiness, on the 11th of January, Dr. Geo. G. Shumard was placed in charge of a party* with instructions to proceed to Red River in Grayson county, making such examinations of the strata along the line of his route, as would enable him to construct an accurate geological section of the country passed over. He was further directed to make a minute and careful exploration of Red River, from Cooke county to the north eastern boundary of the State. Besides accomplishing this work he has made thorough and final surveys of the counties of Grayson, Fannin, Cass and portions of Bowie, Red River and Lamar. He has also assisted me in the examination of Rusk county.

Another party was placed under the direction of Prof. Riddell who entered upon the field work of the survey on the seventh of February. He has made minute and final surveys of the counties of Caldwell, Guadalupe, McLennan and Coryell, and nearly the whole of Bosque, besides aiding me in the detailed examination of Burnet, and in making a reconnoissance of the coal region in the northern part of the State.

*Each party consists, besides the Geologist in charge, of a subordinate assistant, a cook, and a teamster.

Mr. Roessler, in addition to performing satisfactorily his duties as draughtsman, has assisted Dr. Riddell in the survey of Bosque county.

On the 3rd of February, I procured the services of Samuel Heron Esq., who remained in the survey during a large part of the season, and proved a most valuable and efficient aid to Prof. Riddell, in the counties examined by him. Mr. J. F. Brown, of Caldwell county, also rendered valuable assistance in the survey of Coryell, and Mr. Bagby, in the counties of Rusk and Cass.

In the commencement of the Geological Survey, it was deemed important to obtain as soon as practicable, some general knowledge of the geological structure of the State. The leading physical features of the country, and the area and general boundaries of the formations, being once known we would have a good basis for our more detailed examinations of the counties. I have therefore endeavored to make a rapid reconnoissance of as large a district as possible. My lines of exploration have been extended over a considerable portion of Eastern and Middle Texas, as follows :

1st. A section from Austin, through the counties of Travis, Bastrop, Fayette, Washington, Austin to Houston in Harris, distance—172 miles.

2d. From Hempstead through Harris and Liberty, to Sour Lake in Hardin—122 miles.

3rd. From Sour Lake through Hardin, Tyler, Jasper, Saline, San Augustine, Nacogdoches and Rusk to Marshall in Harrison,—256 miles.

4th. From Henderson in Rusk, through Cherokee, Anderson, Freestone, Limestone to Waco in McLennan,—180 miles.

5th. From Austin, through Williamson, Bell, McLennan, Bosque, Johnson, Parker, Palo Pinto to Fort Belknap in Young—240 miles.

6th. From Fort Belknap through Buchanan, Eastland to Camp Colorado in Coleman,—100 miles.

7th. From Camp Colorado through Brown, Lampasas, Burnet and Travis to Austin—150 miles.

In making these preliminary surveys, careful sections of the strata have been made at all points of outcrop, within reasonable distances of the route traveled, and the thickness, stratigraphical order, dip and mineral and fossil characters of the various beds have been determined, with as much precision as possible. We made frequent barometrical observations to ascertain the elevation of the country above tide-water, and much attention has been directed to obtaining a correct knowledge of the topographical fea-

tures, and the kinds and quantity of timber of the districts explored.

Besides accomplishing the above work, I have made detailed surveys of Burnet and Rusk counties, and partial surveys of Travis, Bastrop, Washington, Fayette and Young.

From the foregoing statements, it will be seen that besides a general survey extending over a large portion of the eastern and middle regions of the State, we have made minute and final surveys of eleven counties, two are nearly finished, and a number of have been partially surveyed.

In the counties examined we have determined the areas occupied by each group of rocks, and detailed sections of the strata have been made at all points where they were exposed and their thickness, order of superposition, dip, mineral and fossil contents investigated. In some counties, sections of the strata have been measured at more than one hundred and fifty localities. Particular search has been made for minerals of economical importance and all mines, whether of prospective or known value, have been examined with special care and the probable amount, richness, and quality of the ores determined. Samples of ores and their accompanying minerals, coals, limestones, marbles, clays, mineral waters, etc., have been collected and are now deposited in the Laboratory at Austin, for chemical analysis, and final preservation in the State Cabinet.

A large share of attention has also been devoted to an investigation of the agricultural capabilities of these counties. The different varieties of soils and sub-soils have been carefully examined, numerous specimens have been collected for future study and analysis, and we have spared no pains to ascertain the most advantageous methods of cultivating and improving them. We have also determined, with as much accuracy as possible, the amount and quality of timber in each county, proportion of timber and prairie, elevation of hills, depth and width of valleys, and the amount of available water power furnished by the streams.

Our county maps will embrace the areas occupied by the different geological formations, localities of workable mines, ore deposits, coals, lignites, marble and stone quarries, medicinal and other springs, furnaces, towns, post offices, churches, saw and grist mills and boundaries of timber and prairie. This portion of our labors has often been attended with considerable difficulty, arising from the fact that the maps in the Land Office at Austin,*

*The Survey is much indebted to Hon. F. M. White, who has obligingly permitted us to have free access to the maps in the Land Office.

are more or less imperfect, and the surveys in some instances exceedingly erroneous. It has been sometimes almost impossible to locate our observations with that degree of minuteness and precision which was thought desirable, but we have spared no exertions to remedy defects, supply omissions and to make our maps as complete as possible in their geographical, as well as in their geological details.

The investigations of the Geological Survey have already developed results of the highest interest. It is now known that within the limits of Texas, occur the most complete series of geological formations to be found in any State in the Union, ranging, as they do, from the Potsdam Sandstone of the Palaeozoic era to the latest Tertiary, and presenting an aggregate thickness of many thousand feet. A thorough and systematic study of these different geological groups, cannot fail to afford results of the highest scientific and practical value.

Our partial explorations show the existence of an extensive Coal Formation in the northern part of the State, that will exercise a most important influence on her future welfare and prosperity.* We are not now able to define the precise boundaries of the Texas Coal Measures. To do this with precision would require a much more detailed investigation than the limited time at our disposal has permitted us to make. It may, however, be stated as a reasonable estimate, that the area occupied by the Coal strata cannot fall short of four or five thousand square miles. Taking Fort Belknap as a starting point, we have found this formation to extend uninterruptedly south-eastwardly to Patrick's Creek in the S. W. part of Parker county, a distance of more than sixty miles; westwardly about forty miles, and southwardly beyond Camp Colorado in Coleman county, say one hundred miles. We have not traced it in its northward extension more than six or eight miles from Fort Belknap, but it is highly probable that it reaches into Archer, Baylor and Clay counties. It is also probable that the same formation is developed in San Saba and some of the counties adjacent.†

The strata composing the Coal Measures, of the region we

*The existence of the true Coal Measures in Texas, was first indicated by Dr. Geo. G. Shumard, in 1851, who mentions their occurrence in the region of Fort Belknap. See Marcy's Report of Exploration of Red River.

†Mr. Marcou, in his "*Carte Geologique des Etats Unis*," has attempted to define the limits of our Coal Measures. But the boundaries laid down by him are incorrect and liable to lead to serious error. The Coal Measures do not extend into Grayson, Fannin, Collin and Dallas counties, as represented in that map.

have described, have a thickness estimated at not less than three hundred feet, and consist of quartzose and argillaceous sandstones, limestones, grits and conglomerates; argillaceous and calcareous shales, fire, potters and pipe clays and coal. Some of these strata and particularly the limestones and shales, are filled with organic remains, among which we have recognized many species which are highly characteristic of the Coal Measures of Missouri, Kentucky, Illinois and Iowa. The shales also frequently contain large and beautiful crystals of selenite and rounded masses of excellent iron ore. The coal at all of the localities examined reposes either on fire clay or shale.

In Young and Buchanan counties, outcrops of coal occur at a number of points, and in the former county it has been struck at many places in excavations for wells. We have here recognized four distinct coal seams, varying from six inches to five feet and presenting an aggregate thickness of eight or nine feet. At the mouth of Whiskey Creek, near Fort Belknap, is an interesting exposure, exhibiting three distinct coal beds, separated by bands of limestone, fire clay, sandstone and shale, and the whole surmounted by sandstone and conglomerate.

In regard to the quantity of coal we do not speak in extravagant terms, when we assert that in the region under consideration, there is an abundance of this most valuable mineral fuel, to supply the present and future demands of the State for centuries. With reference to the quality of the Texas coal, it may be stated that it will compare favorably with most of the coals which are wrought in Missouri, Illinois and Iowa. In general appearance and weight it resembles very closely the coal of St. Louis, Missouri, and Belleville, Illinois.

The following analysis made by Dr. Riddell, in the State Laboratory, shows the chemical constitution of an average specimen from a bed three and a half feet thick, exposed on Whiskey Creek two miles north of Fort Belknap.

Total matter volatile at red heat,	44,136
Weight of Coke,	55,864
	100.
Amount of moisture expelled at 212°	7,8689
Additional matter volatile at red heat,	36,2671
Fixed carbon, (coke)	52,8060
Ash, (ochreous brown)	3,0580
	100.

According to Dr. Riddell, this coal cokes without changing its form and burns with a bright yellow flame.

For the sake of comparison we subjoin the following analysis by Prof. J. D. Whitney, Chemist, of the Geological Survey of Iowa, showing the composition of a specimen from Van Buren county Iowa, regarded as one of the best coals in that State.

Moisture,	3,30
Volatile and combustible,	37,98
Fixed carbon,	54,35
Ash ^c	237

100.

Besides the coal area just described, it is highly probable that productive coal beds will be discovered in the extreme western part of the State. This opinion is founded upon an interesting group of fossils from the Hueco Mountains, and a part of the Guadalupe Range, which were obtained by Dr. Geo. G. Shumard, while connected with the Expedition of Capt. Pope. In this collection I have found with some forms that are undescribed, quite a number of well marked species of the Coal Measure. I am also informed by Hon. J. F. Crosby, of El Paso, that coal has been discovered at one or more points in El Paso county. Should future researches develop the existence of workable seams of coal in this portion of our State, they will prove a fertile source of wealth and their value can scarcely be overestimated.

Connected with the Tertiary Formation, which occupies a vast area in the Eastern and Middle portions of the State, are extensive beds of brown coal or lignite, which will, I think, be of great service to the public. Our detailed examinations in Rusk show that a large portion of this county is underlaid by deposits of this material, exposures of which occur at a great many localities. The beds examined vary from six inches to eight feet in thickness, and are associated with bituminous shale, fire and potters clay, soft quartzose and argillaceous sandstone, impure limestone and iron ore. At a number of localities visited the lignite appears to be of good quality and adapted for the ordinary purposes of fuel. It varies greatly in character in different sections of the county, some specimens exhibiting the woody fibre with tolerable distinctness, while others show no traces of organic structure, being dull, shining-black and very compact in texture.*

*An example of this variety from the neighborhood of Iron Mountain P.

In the N. E. corner of Cass County, at "Stone Coal Bluff," examined by Dr. G. G. Shumard, there is a bed of lignite ten feet thick which resembles the bituminous coal of Fort Belknap, both in external character and chemical composition, ** and it is quite probable that it may be employed to advantage in the manufacture of iron. Regular seams of lignite of more or less value have been discovered by different members of the corps, in the counties of Grayson, Harrison, Caldwell, Guadalupe, Bastrop and Fayette, and we have heard of many other localities in various sections of the State which we have not yet been able to visit.

Brown Coal or lignite is in general inferior to true bituminous coal which belongs to an older geological formation, nevertheless its importance has usually been underated. In Germany and Prussia, large quantities of lignite are annually mined to supply the inhabitants with fuel, and the Tertiary brown coal of the Pacific coast has been successfully employed for purposes of Ocean Steam navigation. It is estimated that the heat given out by lignite is about one-third more than that of wood. The better varieties of Texas lignite may not only be used as fuel but it is also probable that some of them may also be employed for the manufacture of illuminating gas.

Among the combustible minerals, may also be mentioned the occurrence of *Petroleum*, which has been observed at several points in the State. The most important locality visited is at Sour Lake in Hardin County, where this substance may be collected in considerable quantity from the surfaces of the remark-

O., analyzed by Dr. Riddell, gave the following result:

Specific gravity, 1,094,	15,701
Moisture expelled at 212°	4,105
Matter volatile at red heat,	79,137
Fixed carbon,	1,057
Ash,	
	100,000

This lignite burns with a somewhat offensive odor, and is remarkable for the large amount of fixed carbon it contains. Its composition seems to indicate, that it may be employed in smelting iron ores, both as a flux and as fuel.

** Dr. Riddell's examination of an average specimen of this lignite gave:

Specific gravity, 1,483.	15,80,80	} Total amount of volatile matter 55,23 weight of the coke 44,77
Moisture expelled at 212°	39,4220	
Matter volatile at red heat,	39,7880	
Fixed carbon,	4,992	
Ash, (grayish-brown)		
	100—	100—

able acid springs adjacent to the Lake. The earth for some distance around these springs, is also so highly charged with bitumen as to be employed for purposes of illumination and to some extent as a fuel.

In addition to her coal deposits, Texas embraces within her limits vast accumulations of iron ore, which require only judicious expenditures of labor and capital to be converted into fertile sources of wealth.

Until the commencement of the present Survey, it was not known that we had workable deposits of iron except in one or two localities. But our labors have demonstrated the important fact that we have a vast iron region in the eastern part of the State, embracing considerable areas in Cass, Harrison, Rusk, Panola, Smith, San Augustine and Shelby counties. The ore deposits belong to the Tertiary Era, and consist chiefly of hematites and limonites of which there are several varieties.

According to Dr. G. G. Shumard, Cass county alone is capable of supplying a number of furnaces with an abundance of excellent iron ore for many years. The ore occurs here in regular layers, which sometimes attains a thickness of fifty feet. The only iron furnace our State can boast of is located in this county. It was erected several years since by Mr. Nash, and has been in nearly constant, and I believe profitable operation up to the present time. The ore is mined near the furnace, and the kinds preferred are a porous variety of hematite, termed by the proprietors "honey-comb ore" and compact brown hematite.* The pig metal and castings produced from these ores, are of excellent quality and command a high price in the market. Dr. Riddell's analysis of an average specimen of the honey-comb variety from the Nash mines yielded the following result.*

Our detailed examinations in Rusk county, have developed the occurrence of almost inexhaustible deposits of workable hematite, similar to that found in Cass, * * while our general surveys in Cherokee, Nacogdoches and the other counties above enumer-

*Specific gravity, 2,2891

Moisture and matter volatile at red heat,
Silica,
Per-oxide of iron,
Loss,

12,227
8,122
79,604
 ,047

100,—

** Dr. Riddell's analysis of a specimen taken from an extensive ore deposit in Rusk county, about four miles east of Sulphur Springs, gave :

ated, have convinced us that farther explorations will reveal there also the existence of equally extensive accumulations of this important element of state wealth.

Other deposits of iron occur in the Tertiary strata in the middle division of the State, but so far as our observations have been carried, these ores are inferior to those found in the East. In the counties of Caldwell and Guadalupe, examined by Dr. Riddell, are heavy deposits of iron ore, but they contain such a large proportion of silex in the form of sand, as to render them generally unfit for profitable smelting. We have fair workable ores from Bastrop and Washington counties, but further researches are necessary, before we can give a positive opinion respecting their value.

Throughout the region of the Coal Measures in the northern part of the State, we frequently find bands of argillaceous iron ore interstratified with the gypseous shales, while the surface of the ground is often thickly strewn with masses of hydrated iron ore from the size of a filbert to that of the double-bist. In Young and Buchanan counties, these ores are often quite abundant in places, and they appear to be well adapted for smelting, although our investigations have not been sufficiently minute to enable us to determine whether they occur in sufficient quantity to be wrought with profit.

Lead. In the districts examined, no important deposits of lead have yet been found, but we have received from different parts of the State specimens of galena or sulphuret of lead, which induce the belief that future researches will develop the existence of valuable veins of this metal. Thus we have samples of remarkably rich ore from the western part of the State, near El Paso, the Wichita Mountains and Fort San Saba. In Llano County, occurs an interesting ore, the molybdate of lead, which is quite rare in mineralogical collections. Specimens of it from this region were presented to the State Cabinet by Dr. Moore of Burnet, who informs me that it is quite abundant.

Copper. According to Dr. Geo. G. Shumard, small rounded

Specific gravity, 3,3245.

Alumina,

Silicious matter insoluble in acids,

Per-oxide of iron,

Water

1,0360,

8,7941

71,7826

18,3873

100,—

The specimen analyzed represents a variety that is very common throughout the iron region of this part of the State.

masses of the oxide and carbonate of copper occur distributed abundantly over the surface of the country towards the source of the Big Wichita, Brazos and Red Rivers, and it is not improbable that productive veins of copper will be found in this region.

We have also seen fine specimens of native copper from the extreme western part of the State.

Silver. All the sulphurets of lead that we have seen from Texas are more or less argentiferous. A specimen analyzed by Dr. Riddell, contains nearly nine ounces of silver to the ton of ore.

Much has been said concerning the existence of silver in Cass county. For the benefit of the citizens it may be stated, that after a careful examination, we are convinced that the geological formations of that county, are of a character to preclude the possibility of finding the precious metals there, and consequently all search for them will end in disappointment, if not pecuniary loss. The substances that have been supposed to contain silver are simply good ores of iron.

Gypsum. This valuable material has a vast development both horizontally and vertically in our State. According to Dr. Geo. G. Shumard,* who has had fine opportunities for exploring the gypsum district in Texas and the adjacent Territories, it occurs in the greatest abundance in the country watered by the upper portion of the Canadian, Red, Big and Little Wichita, Brazos and Pecos Rivers. On Red River the gypsum beds are from a few inches to thirty feet thick. On Delaware Creek, a few miles belows its source they are sixty feet, while between the Big Wichita and Brazos Rivers, there are hills nearly seven hundred feet high, composed almost entirely of this material. It is usually of pure white, more or less granular and sometimes resembles loaf sugar. Occasionally it assumes the character of fibrous gypsum, selenite and compact alabaster. We have also found gypsum in the form of selenite somewhat abundantly disseminated through the marls of the Cretaceous Period in Grayson county, and those of the Coal Measures in Young and Buchanan. The crystals are frequently quite large, and form beautiful cabinet specimens. The gypsum field of Texas is believed to be the largest in the world, and capable of supplying all the demands of the South and West for thousands of years.

In several counties we have discovered extensive deposits of potters, pipe and fire clays, and inexhaustible beds of calcareous

*Unpublished report on the Geology of the U. S. Expedition, under Capt. J. Pope, for boring Artesian Wells &c.,

marl. Limestones, sandstones and other materials adapted for building purposes have also been met with in nearly every portion of the country examined. In Burnet county we have found extensive tracts underlaid by building rocks of great beauty and durability, and there occurs here a beautiful variegated limestone of remarkably fine texture, which receives a good polish and forms a handsome marble for ornamental work. A considerable district in this county is likewise occupied by a rather coarse red granite, which, if properly selected may be advantageously employed in the construction of such works as require great strength and durability. In the State of Missouri a rock of the same kind is frequently employed for mill stones, for which purpose it is tolerably well adapted.

In the counties of Young and Rusk, valuable beds of hydraulic limestone occur, and we have collected specimens from other parts of the State, which appear to possess hydraulic properties, but farther experiments are necessary before we can decide positively upon their value. *

Our collection of soils, clays, rocks, ores, coals and fossils is quite extensive and already embraces many objects of great interest and rarity.* The suit of organic remains is especially large and valuable, and it is believed when carefully studied will throw considerable light on some disputed points in the geology of the West and South-west.

The following is a statement of expenditures made on account of the Geological Survey, from its commencement to the 1st Nov., 1859.

Salaries of State Geologist and Assistants,	\$5,187,50
Services of Draughtsman,	560,00
Hire of sub-assistants, teamster, and cooks	1448,21
Expenses of going to New York for instruments etc.,	332,62
Instruments, chemicals and chemical apparatus,	1030,75
Fitting up geological rooms and laboratory,	532,72
Loomis & Christians acct. for building stable,	480,33
Horses and mules,	1,479,25
Wagons, harness and saddlery,	1,091,95

*Among these we may mention a magnificent mass of meteoric iron, from the head waters of Brazos River, presented by the late Maj. R. S. Neighbors. This interesting specimen weighs upwards of three hundred pounds, and is one of the finest examples of native iron to be found in any cabinet in the United States. It is earnestly hoped that the citizens of the State will continue to aid us in our labors, by sending to the geological rooms at Austin, specimens of rocks, ores and fossils, from their respective neighborhoods. It is our aim to form at the Capitol, a complete collection illustrating the geology, mineralogy, palaeontology and natural history of the State.

Outfit, camp expenses, provisions, forage and black-	
smithing	2,488,04
Traveling expenses,	236,60
Transportation of specimens, &c.,	121,32
Postage acct.	15,48
Stationery,	63,38
Exchange,	4,85

\$15,073,00

In conclusion it affords me much gratification to acknowledge here, our indebtedness to the citizens of the State, who have everywhere manifested the warmest interest in the progress of the work, and encouraged us by their aid and kind hospitalities.

All of which is respectfully submitted,

B. F. SHUMARD,
State Geologist.

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Date Due





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